CLAIMS

I claim:

1. A method for providing an optical signal to a semiconductor, comprising the steps of:

(a) providing a semiconductor substrate having a first surface and a second surface opposite said first surface, a first semiconductor layer of a first semiconducting material adjacent said first surface, said first semiconductor layer on a second semiconductor of a second semiconducting material, said first semiconducting material having a higher absorption coefficient than said second semiconducting material when both said first semiconducting material and said second semiconducting material are undoped;

(b) forming a device in said first semiconductor layer to collect carriers generated by the optical signal; and

(c) directing the optical signal at said second surface wherein a portion of said optical signal can pass through said second semiconductor and said portion is absorbed by said first semiconductor material in said first semiconductor layer.

2. The method of claim 1 wherein said optical signal comprises an optical clocking signal.

3. The method of claim 1 wherein said optical signal comprises an optical data signal.

4. The method of claim 3 wherein said optical data signal comprises digital data for data processing, text, graphic, voice, or video.

5. The method of claim 1 wherein said optical signal is absorbed in said first semiconductor layer for generating an electrical signal.

6. The method of claim 1 wherein said first semiconducting material comprises germanium and said second semiconducting material comprises silicon.

7. The method of claim 6 wherein said germanium containing material comprises SiGe.

8. The method of claim 6 wherein said step (a) includes the step of depositing a layer containing germanium, and wherein said step (b) includes the step of forming said device in or on said layer.

9. The method of claim 6 wherein during said step (a) the germanium concentration of the germanium containing layer is graded.

10. The method of claim 1 wherein said first semiconducting material comprises a lower bandgap than said second semiconducting material.

11. The method of claim 1 wherein said first semiconducting material comprises an amorphous material or a direct bandgap material and said second semiconducting material comprises a crystalline material or an indirect bandgap material.

12. The method of claim 1 wherein the energy of said optical signal is in the range from .66eV to 1.12eV.

13. The method of claim 1 wherein said device is selected from a P-N diode, a PIN diode, a Schottky diode and a transistor.

14. The method of claim 1 wherein said substrate is an integrated circuit chip and wherein a plurality of said devices are distributed around said integrated circuit chip for simultaneously receiving said optical signal.

15. The method of claim 14 wherein said optical signal comprises an optical clocking signal, and wherein said integrated circuit chip further comprises devices or circuits that use said clocking signal when it is converted to an electrical clocking signal.

16. The method of claim 14 further comprising a plurality of integrated circuit chips, wherein each of said integrated circuit chips comprise at least one of said devices and wherein each of said integrated circuit chips are configured to receive said optical signal.

17. The method of claim 16 further comprising a multi chip module containing said plurality of integrated circuit chips, wherein each of said integrated circuit chips comprises at least one of said devices and is configured to receive said optical signal.

18. An opto-electronic system comprising:

a semiconductor substrate having a first surface and a second surface opposite said first surface, a first semiconductor layer of a first semiconducting material adjacent said first surface, said first semiconductor layer on a second semiconductor of a second semiconducting material, said first semiconducting material having a higher absorption coefficient than said second semiconducting material when both said first semiconducting material and said second semiconducting material are undoped;

a device in said first semiconductor layer to collect carriers generated by an optical signal; and

an optical transmitter shining said optical signal on said second surface wherein said optical signal has a wavelength, wherein a portion of said optical signal can pass through said second semiconductor layer but said portion is absorbed by said first semiconductor material in said first semiconductor layer for collection by said device.

19. The opto-electronic system of claim 18 wherein said first semiconducting material comprises germanium and said second semiconducting material comprises silicon.

20. The opto-electronic system of claim 19 wherein said germanium containing layer is germanium or SiGe.

21. The opto-electronic system of claim 19 wherein the germanium concentration of said germanium containing layer is graded.

22. The opto-electronic system of claim 19 wherein said germanium containing layer has a thickness ranging from about .1um to about 1um.

23. The opto-electronic system of claim 19, wherein said germanium containing layer is also used in said integrated circuit chip to provide a base for a bipolar transistor.

24. The opto-electronic system of claim 18 wherein said device is selected from the group consisting of a P-N diode, a PIN diode, a Schottky diode and a transistor.

25. The opto-electronic system of claim 18 further comprising an integrated circuit chip wherein a plurality of said devices are distributed around said integrated circuit chip for simultaneously receiving said optical signal for optical clocking.

26. The opto-electronic system of claim 25 further comprising a plurality of integrated circuit chips, wherein each of said integrated circuit chips comprises said device and is configured to receive said optical signal for optical clocking.

27. The opto-electronic system of claim 25 further comprising a multi chip module containing said plurality of integrated circuit chips, wherein each of said integrated circuit chips comprises said device and is configured to receive said optical signal for optical clocking.

28. The opto-electronic system of claim 18 wherein said first semiconducting material comprises a lower bandgap than said second semiconducting material.

29. The opto-electronic system of claim 18 wherein said first semiconducting material comprises an amorphous material or a direct bandgap material and said second semiconducting material comprises a crystalline material or an indirect bandgap material.

30. A method for providing a signal comprising the steps of:

(a) providing a first semiconducting material on a second semiconducting material;

(b) providing a device in said first material for receiving an optical signal;

(c) directing an optical signal to said second semiconducting material, said optical signal having a wavelength, wherein a portion of said optical signal passes through said second semiconducting material and is absorbed by said first semiconducting material, wherein said first semiconducting material has a higher absorption coefficient than said second semiconducting material when both said first semiconducting material and said second semiconducting material are undoped; and

(d) generating an electrical signal in said device based on said absorbed optical signal.

31. The method of claim 30 wherein said first material comprises a germanium containing layer and said second material comprises silicon.

32. The method of claim 31 wherein said germanium containing layer is SiGe or Ge.

33. The method of claim 32 wherein the germanium concentration of said SiGe is graded.

34. The method of claim 30 further comprising receiving said optical signal in a plurality of said devices in said first material.

35. The method of claim 30 wherein energy of said optical signal ranges from .66um to 1.12 um.

36. The method of claim 30 wherein said device is selected from a P-N diode, a PIN diode, a Schottky diode and a transistor.

37. The method of claim 30 wherein said first material and said second material are part of an integrated circuit chip and wherein a plurality of said devices are distributed around said integrated circuit chip for simultaneously receiving said optical signal.

38. The method of claim 37 wherein said optical signal comprises an optical clock signal, and wherein said integrated circuit chip further comprises devices or circuits that use said clock signal.

39. The method of claim 37 further comprising a plurality of integrated circuit chips, wherein each of said integrated circuit chips comprises at least one of said devices configured to receive said optical signal.

40. The method of claim 39 further comprising a multi chip module containing said plurality of integrated circuit chips, wherein each of said integrated circuit chips comprises at least one of said devices and is configured to receive said optical signal.

41. The method of claim 30 wherein said first semiconducting material comprises a lower bandgap than said second semiconducting material.

42. The method of claim 30 wherein said first semiconducting material comprises an amorphous material or a direct bandgap material and said second semiconducting material comprises a crystalline material or an indirect bandgap material.